

# NASA TECH BRIEF

## Lyndon B. Johnson Space Center



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### Nonflammable Potting-Encapsulating and Conformal Coating Compounds

#### The problem:

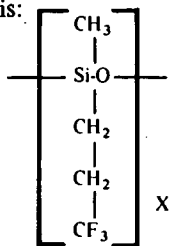
Most nonflammable potting and encapsulating compounds will burn in an oxygen atmosphere or under higher than normal oxygen partial pressure. Circuits used in high-oxygen environments require a new potting compound if they are to be nonflammable.

#### The solution:

Two fluorosilicone rubber formulations have been produced which are nonflammable or self-extinguishing in environments of up to  $11.4 \times 10^4$  N/m<sup>2</sup> (16.5 psi) of oxygen.

#### How it's done:

The first of the two formulations is designated F-387 and is a room-temperature-vulcanizing fluorosilicone polymer. It consists primarily of two commercially available polymers. One of these constituents, a proprietary dimethylsilicone rubber formulation containing carbon black, is a common existing encapsulating resin. Its basic structure is:



The incorporated fluorine atoms improve the thermal properties of the compound. The other main constituent of F-387 is a commercially available form of perchloropentanacyclodecane that is added for its flame resistant properties. The resulting mixture is low-temperature curing, highly flame resistant, and has an insulation resistance greater than  $5 \times 10^8$  ohms.

The second formulation, F-109a, is a modification of a proprietary, conventional fluorocarbon polymer

and cures at a temperature which, although higher than the first compound, is low enough to allow curing without damaging electronic components (65° C, 150° F). The formulation is modified by the addition of boric acid to improve the viscosity and MgO and CaO to enhance the flame resistance. Also, tetraethylene pentamine, a solvent commonly used in the production of silicone rubbers, is added.

#### Note:

As part of the work done on these compounds, an extensive report was prepared. It includes much information on testing, and describes many alternate formulations. This documentation may be obtained from  
National Technical Information Service  
Springfield, Virginia 22151  
Single document price \$6.00  
(or microfiche \$0.95)

Reference: NASA CR-115364 (N72-17533)  
Development of Organic Non-Flammable Spacecraft Potting, Encapsulating, and Conformal Coating Compounds.

#### Patent status:

Inquiries concerning rights for the commercial use of this invention should be addressed to:

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Furane Plastics, Inc.  
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